UNIVERSITI TEKNOLOGI MARA

THE DOCTORAL RESEARCH ABSTRACTS

Volume: 9, Issue 9 April 2016

NINTH ISSUE

INSTITUTE of GRADUATE STUDIES

IGS Biannual Publication

36

Name : Nadiah Hanim Mohd Noordin

Title : Cooking Oil Waste as Corrosion Inhibitor for Mild Steel in 1M HCl Solution

Supervisor : Dr. Junaidah Jai **(MS)**
Dr. H N M Ekramul Mahmud **(CS)**
Associate Prof. Dr. Norazah Abd Rahman **(CS)**
Associate Prof. Dr. Md Amin Hashim **(CS)**

Metals generally tend to move to its original state by corrosion process. Mild steel is an alloy form of iron, which undergoes corrosion easily in acidic medium. Palm cooking oil waste (PCOW) was introduced as a new organic corrosion inhibitor due to its fatty acids content. PCOW was soluble and stable in water at pH 11, 50˚C with ratio 75: 25 oil to water respectively. The reaction between fatty acid in PCOW with NaOH was produced surfactants which solubilise oil in water and produce o/w emulsion. The fatty acids in PCOW were further reacted with diethylene triamine to increase the adsorption process of PCOWAI on steels surface. The inhibition behaviour of palm cooking oil waste inhibitor (PCOWAI) on mild steel in 1M HCl as corrosive solution containing different concentrations of PCOWI at 299, 323 and 343K was investigated by weight loss and potentiodynamic polarization and electrochemical impedance spectroscopy. It has been observed that corrosion rate decreases and inhibition efficiencies and surface coverage degree increases with increasing in PCOWI concentration. The maximum inhibition efficiency 100% was observed in the presence of 0.25 M inhibitor at 299K. The recorded potentiodynamic polarization data indicated the basic modification of steel surface as a result in a decrease in the corrosion rate. The results from this corrosion test clearly reveal that the PCOWAI behave as a mixed type corrosion inhibitor with the highest inhibition at 0.25M. The experimental data fitted into Temkin adsorption isotherms. PCOW exhibits a very good performance as a corrosion inhibitor for mild steel in 1M HCl. Corrosion inhibition could be explained by considering an interaction between metal surface and the inhibitor. Data obtained from EIS measurements, were analyzed to model the corrosion inhibition process through appropriate equivalent circuit model, a constant phase element (CPE) has been used. Surface analyses via scanning electron microscope (SEM) shows a significant improvement on the surface morphology of the mild steel. SEM studies reveal the formation of film on the metal surface. X-ray photoelectron spectroscopy (XPS) analysis was carried out to study the inhibition mechanism of PCOWAI on corrosion of mild steel in 1 M HCl solution. The binding energy values revealed the presence of carboxyl and amide group enhance the adsorption process of PCOWAI molecules on mild steel surface